

<p align="center">11 VEHICLE LAMP EXAMINATION</p>	<p align="center">Page 1 of 5</p>
<p align="center">Division of Forensic Science</p> <p align="center">FIREARM/TOOLMARK PROCEDURES MANUAL</p>	<p align="center">Amendment Designator:</p>
	<p align="center">Effective Date: 21-April-2003</p>
<div align="center"> <p>11 VEHICLE LAMP EXAMINATION</p> </div> <p>11.1 Introduction</p> <p>The primary purpose of a lamp filament analysis is to determine whether the lamp was lighted or unlighted at the moment of impact. Fortunately, the filaments of incandescent lamps often give the key to answering the question. The stresses generated on a filament by the accelerations and sudden stops of a collision produce deformation and fracture phenomena with characteristic differences between hot and cold filaments. Further evidence may arise if the glass bulb is broken during the accident. If the filament is hot, it will be oxidized and it may melt any broken glass that comes in contact with it.</p> <p>The examiner conducting a lamp analysis should make every effort to obtain all lamps that are located in the damaged area of the vehicle, as well as an accident report. In addition, the socket position on the vehicle from which the lamp is removed and the function of the lamp should also be obtained from the investigator. Lamps should be identified with a unique item number and described as to type of lamp and specific location on the vehicle from which it was obtained, The terms “passenger” and “driver” side rather than “right” and “left” side of the vehicle, so that position from which the lamp is removed is totally clear.</p> <p><i>Example:</i> #1 head lamp – passenger side, outside lamp #2 parking lamp – driver side</p> <p>Lamp examinations can also be conducted on other types of vehicles and objects. Bicycles, farm tractors, caution signs, traffic lights and the like may yield evidence helpful to an investigation. Any lamp, which has been involved in a collision or has been impacted, may yield some helpful information; however, there may not always be sufficient information to make a definitive conclusion.</p> <p>11.2 Safety Considerations</p> <p>Examinations performed in the Firearm and Toolmark Section are inherently hazardous. These procedures involve hazardous chemicals, firearms, ammunition, and power tools. All hazardous procedures must be performed in compliance with the DFS Safety Manual.</p> <p>Examiner should consider the use of eye protection.</p> <ul style="list-style-type: none"> • Use caution in examining lamps and testing circuits. • Never look directly into a lamp which is on with the naked eye. Caution should be used as the light given off during white heat can injure the eyes. • Ordinary sunglasses are not dark enough. Use a piece of exposed film. • Broken bulbs have very sharp edges and can produce severe cuts. • Electrical circuits may be energized and could produce electrical shocks. <p>11.3 Preparation</p> <p>NONE</p> <p>11.4 Instrumentation</p> <ul style="list-style-type: none"> • Stereo microscope • Comparison microscope • Photographic equipment • Propane torch or similar heating device • Test Equipment Needed for circuit testing -a two cell flashlight, lamp of 3 volt capacity; if glass is broken, do not use a 6 or 12 volt system as this may oxidize a filament. • A volt-ohmmeter may be used to measure resistance of the wire. 	

<p align="center">11 VEHICLE LAMP EXAMINATION</p>	<p align="right">Page 2 of 5</p>
<p align="center">Division of Forensic Science</p> <p align="center">FIREARM/TOOLMARK PROCEDURES MANUAL</p>	<p align="right">Amendment Designator:</p>
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<div data-bbox="248 300 584 394"> <ul style="list-style-type: none"> • Batteries • Hand tools • Other equipment as needed </div> <div data-bbox="152 424 763 453"> <p>11.5 Minimum Analytical Standards and Controls</p> </div> <div data-bbox="248 485 321 512"> <p>NONE</p> </div> <div data-bbox="152 546 500 575"> <p>11.6 Procedure or Analysis</p> </div> <div data-bbox="248 606 1481 667"> <p>The evidence will be marked in accordance with the Quality Manual. A systematic approach should be used for the vehicle lamp examination, with recording of findings and observations in the notes.</p> </div> <div data-bbox="248 697 730 726"> <p>11.6.1 General Lamp Examination Procedure</p> </div> <div data-bbox="345 758 1507 1272"> <ul style="list-style-type: none"> • Classify lamp as to the brand, type, base arrangement, bulb shape, electrical rating (voltage/wattage) and filament configuration and purpose in vehicle • Document the physical appearance of the lamp through photographs or sketches • Note the physical condition of the glass (breakage/discoloration) • Note the physical condition of the base (type of metal, markings present) • Note the physical appearance of the filament(s) to include the amount of distortion/stretching • Presence or absence of any discoloration of the metal, oxide deposits • Presence or absence of age sag, pitting of the metal • Presence of cold fracture • Presence of molten or melted glass • Other physical phenomena observed • It may be necessary to open the lamp, as described in Sections 11.6.3 and 11.6.2.4 • Determine, using a volt-ohmmeter or the procedure listed in 11.6.2 whether the filament(s) is operational • If observations are inconsistent, it may be advantageous to use comparison lamps to show similarities in lamp configurations and conduct experiments to simulate characteristics observed in the evidence • Record findings and observations in the notes by documenting and/or photographing </div> <div data-bbox="248 1302 503 1331"> <p>11.6.2 Circuit Testing</p> </div> <div data-bbox="345 1362 1437 1423"> <p>Testing the filament is done after the lamp has been removed from the vehicle and all observations and photographs have been made. It serves to determine whether the filament in the lamp is intact.</p> </div> <div data-bbox="345 1455 1313 1551"> <ul style="list-style-type: none"> • Connect the lamp of the vehicle, the lamp of the flashlight, and the batteries in series • If either or both of the lamps light, the circuit is intact and the filament is not separated • A very high OHM reading means that the filament is broken </div> <div data-bbox="248 1581 730 1610"> <p>11.6.3 Small Lamp Examination Procedure</p> </div> <div data-bbox="345 1642 1518 1703"> <p>Opening small lamps is a simple procedure, but care must be used with broken glass. Continuity testing with a volt-ohm meter should be conducted before opening any lamps.</p> </div> <div data-bbox="345 1734 1539 1925"> <ul style="list-style-type: none"> • Place a piece of plastic wrap around the glass • Place the lamp bulb right side up in the jaws of a vise, while holding onto the base of the lamp • Wear protective eye coverings • Slowly and gradually close the vise jaws on the glass bulb until the pressure exerted on the glass causes it to break • Carefully remove the lamp from the vise </div>	

<p align="center">11 VEHICLE LAMP EXAMINATION</p>	<p align="center">Page 3 of 5</p>
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<div data-bbox="345 296 1463 520"> <ul style="list-style-type: none"> • Turn the lamp upside down over a piece of paper to catch any material that has fallen into the base • Any sharp edges of glass can be removed with a pair of pliers • Compare the condition of the filament now to how it appeared prior to opening it • Another method of opening a small lamp involves using a glass tube cutter and diligently following the exact same path around the glass until it weakens so that it can be separated; this is a very tedious procedure that reduces the possibility of damaging the filaments and internal lamp parts • Record findings and observations in the notes by documenting and/or photographing </div> <div data-bbox="248 548 808 579"> <p>11.6.4 Sealed Beam Lamp Examination Procedure</p> </div> <div data-bbox="345 609 1528 669"> <p>The following method has been used successfully for opening sealed beam lamps, and is preferred over tapping methods as it reduces the possibility of damaging the filaments.</p> </div> <div data-bbox="345 701 1544 1178"> <ul style="list-style-type: none"> • Relieve the vacuum on the lamp, by removing the seal • Make a paper towel tube and attach it at the ends with masking tape to form a circle approximately 4 - 5 inches in diameter • Wet the paper towel circle with cold water and squeeze excess water out completely • Place the front of the lamp down • Using a torch set with a fine flame, draw a circle on the back of the lamp around the lug connectors, about the same diameter as the paper towel circle • Follow the same path around the circle about 4 or 5 times, or until sufficiently heated • Place the paper towel circle onto the heated area, and hold it there until a cracking sound is heard • Once the cracking sound has stopped, pick up the paper towels, and there should be a circular crack mark on the back of the lamp • Pull on the lug connectors; that portion of the glass envelope containing the filaments should separate from the lamp and for examination • If necessary, gently tap the edges with a rubber hammer, while holding the lug connectors with a pair of pliers, to remove that area of the glass envelope for examination </div> <div data-bbox="248 1205 602 1236"> <p>11.6.5 Interpretation of Results</p> </div> <div data-bbox="345 1266 805 1297"> <p>Record interpretation of results in the notes</p> </div> <div data-bbox="345 1327 602 1358"> <p>Description of the lamp:</p> </div> <div data-bbox="386 1388 1500 1449"> <p>This gives information about the lamp as to its type and description. It may also offer the position of the lamp as it was on the vehicle.</p> </div> <div data-bbox="345 1478 492 1509"> <p>Observations:</p> </div> <div data-bbox="386 1539 1500 1602"> <p>In the body of the "Certificate of Analysis" under the "Results" heading, the appearance of the lamp, the functionality of the filament(s) and both normal and abnormal characteristics are reported.</p> </div> <div data-bbox="345 1631 483 1663"> <p>Conclusions:</p> </div> <div data-bbox="386 1692 1528 1753"> <p>Additionally, in the "Results" section of the report, the conclusions, based on the observations reported, are stated. Possible conclusions and indicated conditions:</p> </div> <div data-bbox="386 1785 1544 1911"> <ul style="list-style-type: none"> • Examination of the {item #} lamp revealed physical characteristics consistent with it having been lighted when it was subjected to impact shock and the glass envelope was broken (damaged). See Criteria I • Examination of the {item #} lamp revealed physical characteristics consistent with it having been lighted when it was subjected to impact shock (damaged). See Criteria II </div>	

<p align="center">11 VEHICLE LAMP EXAMINATION</p>	<p align="right">Page 4 of 5</p>
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<div data-bbox="386 296 1542 485"> <ul style="list-style-type: none"> • Examination of the {item #} lamp revealed it not to have been lighted when it was subjected to impact shock (damaged). See Criteria III • Examination of the {item #} lamp revealed insufficient distortion/stretching to definitively determine the “on” or “off” condition at the time of vehicle impact. (damaged). {OR} Examination of the {item #} lamp revealed it to be normal, and therefore it is not possible to determined the “on” or “off” condition at the time of impact. (lamp is normal, with no apparent damage) See Criteria IV </div> <div data-bbox="440 512 1005 543"> <p>11.6.5.1 Criteria for Lamp Examination Conclusions</p> </div> <div data-bbox="540 571 644 602"> <p>Criteria I:</p> </div> <div data-bbox="613 630 1534 848"> <p>The bulb was "on"...(glass broken). Physical characteristics would include an oxidized filament (discolored), possibly with beaded ends, some degree of filament distortion, possibly molten or welded glass on the filaments, possibly white tungsten oxides present on the inner surface of the bulb and/or on the colder surfaces within the bulb (posts, other filament); note that mechanical stretching may occur when glass is broken, so at least one of the other characteristics should be present to make this determination.</p> </div> <div data-bbox="540 875 652 907"> <p>Criteria II:</p> </div> <div data-bbox="613 934 1448 1001"> <p>The bulb was “on”...(glass not broken). Physical characteristics include some significant degree of distortion and stretching of one or both filaments.</p> </div> <div data-bbox="540 1026 662 1058"> <p>Criteria III:</p> </div> <div data-bbox="613 1085 1549 1304"> <p>The bulb was not “on”...The filament has been cold fractured or there is a normal burnout. The absence of physical characteristics such as oxidation of the filament, melted glass, filament distortion cannot determine the “off” condition, when the glass is broken, although these characteristics would be expected to be observed if a lamp was lighted at time of impact and the glass was broken. The absence of the characteristics associated with 7.6.3.2.I above is only an indication that the bulb was not lighted at the time that the glass was broken.</p> </div> <div data-bbox="540 1331 664 1362"> <p>Criteria IV:</p> </div> <div data-bbox="613 1390 1537 1457"> <p>Insufficient characteristics to determine the “on” or “off” condition. The lamp appears normal, or there is insufficient distortion to make a determination.</p> </div> <div data-bbox="152 1484 527 1518"> <p>11.7 Appropriate Appendices</p> </div> <div data-bbox="246 1545 591 1579"> <p>Appendix – Work Sheets (none)</p> </div> <div data-bbox="152 1606 371 1638"> <p>11.8 References</p> </div> <div data-bbox="246 1665 1510 1732"> <p>Badger, Joseph E., “Casting New Light On Lamp Investigation,” Law Enforcement Technology, September, 1989, pp. 38-39, 53.</p> </div> <div data-bbox="246 1759 1510 1824"> <p>Baker, J.S., Aycock, T.L., and Lindquist, T., Lamp Examination for On or Off in Traffic Accidents, The Northwestern University Traffic Institute, 1995.</p> </div> <div data-bbox="246 1852 1537 1942"> <p>Biglio, L., Kubicki, B., and Codella P., FT-IR Diagnostics of Tungsten-Halogen Lamps: Role of Halogen Concentration, Phosphorus, Wall Material, and Burning Environment,” Applied Spectroscopy, Vol. 45, No, 5, 1991, pp.819 – 833.</p> </div>	

<p align="center">11 VEHICLE LAMP EXAMINATION</p>	<p align="center">Page 5 of 5</p>
<p align="center">Division of Forensic Science</p> <p align="center">FIREARM/TOOLMARK PROCEDURES MANUAL</p>	<p align="center">Amendment Designator:</p>
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